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Economic Development

Centers of Excellence

Jon M. Huntsman, Jr.
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ANNUAL REPORT

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Fiscal Year July 2005—June 2006

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2005-2006
Centers of Excellence
Annual Report

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Executive Summary
CENTERS OF EXCELLENCE
2005-06 ANNUAL REPORT

The Centers of Excellence program is now two decades old, having been authorized in 1986. Throughout this time, the program has spawned 126 verified spinouts, of which at least 60 are still active in 2006, employing over 2000 Utahans, as of a 2006 survey done for the Centers of Excellence 20th Anniversary Report. The average salary of employees in COE spinouts is over $65,000. The program's mission is to help technologies created in Utah's colleges and universities transition from research into industry to help grow Utah's economy.

Well-known firms that were assisted by the Centers of Excellence program include Myriad Genetics, Inc. (MYGN), Sonic Innovations, Inc. (SNCI), Cimetrix, Autonomous Solutions Inc., and Moxtek. Emerging successes include InfoWest, Live Wire, Andigen and Rocky Mountain Composites and startups just emerging from the Centers program in the past two years include Flying Sensors, Procerus Technologies, Wasatch Microfluidics Inc., and Glycosan Biosystems. These firms are among the many companies strengthening Utah's economy through technologies developed at Utah's colleges and universities.

For the 2005-06 year, 18 Centers of Excellence received funding totaling nearly $2.5 million in direct grants through the universities. This total included five new Centers and 13 Centers receiving renewal. In addition, three teams received business team support only, to assist them in aligning or preparing a full Center proposal. Universities represented in the program this year included Brigham Young University, the University of Utah and Utah State University.

The Centers of Excellence program implemented a dramatic overhaul of its "consultant program", replacing it with the Business Team Program, which is emerging as an exciting and successful element of the program. Over $550,000 was earmarked to be spent directly with these experienced technology business executives and technology entrepreneurs to assist the Centers in the process of transitioning technologies into the marketplace. These individuals help develop "go to market" strategies, identify and work with potential licensees or customers of the technologies, and in the case of spinouts, assist in the work of getting a new startup off the ground.

Updated policies and procedures were put in place in February, 2006 that helped correct or clarify elements of the program, all designed to improve the success of this challenging transition from university to industry. In addition, during the 2006 Legislative session, changes to the COE statute were implemented to provide for a "return of grant" when a COE supported technology is licensed or moved out of state.

2005-2006 Funded Centers

Acoustics Research

BRIGHAM YOUNG UNIVERSITY

CENTER

This new Center is focused on commercializing active sound control technology with superior ability to both reduce noise in varied settings such as vehicle cabins, computer fans and telecommunications and to modify sounds for commercial benefit, such as enhanced home theater acoustics.

TECHNOLOGY

The Center is developing several technologies aimed at improving noise control, including: active noise control in vehicle cabins, active noise cancellation of high speed fans, the application of energy density sensors to simplify sound control in complex environments, sound quality analysis. This group of technologies is known as noise-cancellation because, in its simplest form, it makes use of a speaker which produces a sound that opposes the noise one is attempting to eliminate, thereby "canceling" the noise.

For this first year, the Center focused its active noise control technology on the application of noise in small aircraft, including helicopters. Early results with helicopter noise show a possible attenuation level of 9dB. With increasing noise regulations, this area of research looks to have great potential.

ACCOMPLISHMENTS

Sound field equalization technology has already generated interest from a Japanese audio company which has led to discussion of a possible Utah spinout that will manufacture the technology. This technology has a variety of applications in the pro-audio market in which sound qualities of an auditorium or recording studio can be more effectively equalized.

In its first year, the Center has been awarded $99,863 in private funding and $137,513 in federal funding. The Center has also worked on securing its intellectual property position and has three patent applications that will be filed next year..

THINK TANK

What if there was...

A way to reduce the noise inside an aircraft or the sound of a computer fan or automatically equalize the speakers in your home theater system?

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Advanced Communications Technology

BRIGHAM YOUNG UNIVERSITY

CENTER

The Center for Advanced Communications Technology was formed to commercialize multi-antennae air-to-ground communication systems. The Center's main focus is using advanced digital signal processing for reliable communication to maneuvering air vehicles (tactical aircraft and UAV's). A secondary focus is using multi-antenna technology to improve commercial wireless communications.

TECHNOLOGY

The Center's technology uses multiple antennae in combination with advanced signal processing to provide a solution to current communication technology, which loses contact with an aircraft during maneuvering such as rolling. The technology may also be applied to unmanned air-vehicles as well as other wireless communications such as mobile phones. Advantages of the Center's technology include its low power consumption, bandwidth efficiency, and small size.

ACCOMPLISHMENTS

After successful architectural design and software simulation of the prototype air-to-ground communication system, the Center is now working on developing the hardware. New developments have also been made in the multi-antennae military communications system. This includes repeaters placed on unmanned air-vehicles that may be reconfigured on command. This technology is being proposed to DARPA.

A license agreement has been negotiated with the university for a spinout which will be incorporated after successful test-flights in the next year.

THINK TANK

What if there was...

A way to always maintain communication with an aircraft during aerial maneuvers ?

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Advanced Imaging LADAR

UTAH STATE UNIVERSITY

CENTER

The Center for Advanced Imaging LADAR (CAIL) focuses on commercializing three dimensional camera products and software based on laser radar and digital camera technology. CAIL's technology has already been used in Japan, and various states in the U.S. In addition to generating interest from NASA for space applications, the technology may revolutionize architecture, engineering, motion pictures, gaming and many other industries.

TECHNOLOGY

CAIL's core technology is the 3D Texel camera, which uniquely combines three-dimensional Laser Detection and Ranging (3D LADAR) technology with two-dimensional digital photography to form a complex 3D image in the same time it takes to snap a photo. 3D LADAR measures the precise distance to, and shape of, objects or terrain while 2D imagery takes a normal digital photograph. The Texel camera merges the information in real-time and, when multiple images are combined, an entire 3D scene is formed that can be viewed from any position instantly.

This year, two new generations of tripod based cameras were developed for a Utah company, InteliSum. In addition, a prototype handheld flash-type lidar camera was developed.

ACCOMPLISHMENTS

CAIL has, in the past year, its third as a Center, successfully commercialized the tripod-based Texel camera for InteliSum (formerly RapidMapper) which is currently in use for mapping and engineering services. Work is continuing on a handheld model, which is half-way to completion.

Markets being investigated include architectural and construction 3D modeling of building interiors, software gaming, movies and electronic entertainment.

The technology is garnering significant interest from military organizations. In January, CAIL was awarded several Federal contracts to develop airborne versions of their technology.

THINK TANK

What if there was...

A way to take a 3D photograph and rotate the image immediately, without ever leaving the field?

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Advanced Satellite Manufacturing

UTAH STATE UNIVERSITY

CENTER

The Center for Advanced Satellite Manufacturing (CASM) is working to create a viable Utah-based satellite manufacturing enterprise based upon years of expertise and projects within Utah State University and its Space Dynamics Laboratory. CASM's approach involves using novel advanced manufacturing and design techniques to reduce the cost and time involved with satellite manufacturing while improving quality and performance.

TECHNOLOGY

CASM's core manufacturing technology is being employed to develop a satellite platform, which can then be specialized to suit the needs of the customer through direct additive manufacturing. This manufacturing technique, referred to as Ultrasonic Consolidation, yields highly modular and easy to build, reliable satellites incorporating a honeycomb-type construction that allows the addition of circuitry, sensors, antennae, and other devices without adhesives.

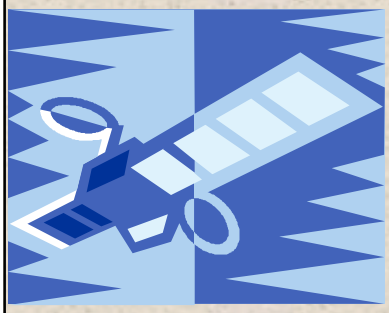
This year, CASM made significant progress with its technology and successfully demonstrated the capabilities of Ultrasonic Consolidation for satellite manufacturing. The Center also began development of a materials property database for structures developed using Ultrasonic Consolidation.

ACCOMPLISHMENTS

CASM has formed a relationship with SDL and has secured additional funding to further their research. The Center has also developed a business model and has a business team in place for commercialization.

THINK TANK

What if there was...



A modular satellite that could be easily customized for a variety of applications without the need for difficult assembly?

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Biomedical Microfluidics

U N I V E R S I T Y O F U T A H

BIOMEDICAL MICROFLUIDICS

The Center for Biomedical Microfluidics focuses on development of miniaturized fluidic systems that are capable of measuring, actuating, or separating biological materials. The Continuous Flow Microspotter (CFM) is one such device that operates like an inkjet printer. A solution composed of proteins, nucleic acids, cells, lipids, or other material flows through miniature channels and is spotted onto a substrate such as a microarray chip. This system allows highly accurate arrays to be developed inexpensively and accommodates the small sample sizes which are commonly encountered in biomedical applications. Expanded applications of the technology include point-of-care diagnostics. The scale and ease of use give the CFM a significant advantage in assays of patient samples performed by a physician or lab technician.

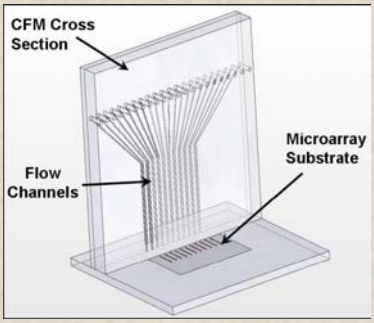
TECHNOLOGY

This year, the Center has further expanded the capabilities of the CFM to include ELISA assays and lipid bilayers. The Center has also continued its collaboration with the Center for Homogenous DNA in the areas of DNA extraction, amplification and melting, and is now working on continuous flow DNA amplification.

ACCOMPLISHMENTS

Over the past year, the Center generated its first external revenue for the microspotter technology, and has filed four patent applications. Negotiations are also underway between the Center's spinout, Wasatch Microfluidics, and several industrial partners for development funding and marketing agreements.

The quality of the microspotter has been demonstrated with a full suite of biological samples, including proteins, DNA, lipids, and cells. This led to a highlight of the technology in the publication *Nature Methods*. The ability to produce continuous flow DNA amplification has also been demonstrated as well as DNA melting in a 5x5 array. Significant strides have been made in the manufacturing of the spotter; preliminary high volume manufacturing is able to reliably produce a 12-spot system. In addition, an automated instrument has been developed for the CFM which is being tested by multiple labs.



THINK TANK

What if there was...

A printer for biological samples that creates inexpensive, highly consistent micro-arrays?

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CASPeR

UNIVERSITY OF UTAH

CENTER

The Center for Alternate Strategies of Parasite Removal (CASPeR), in its second and last year of funding, has developed a safe, nontoxic and rapid treatment for Pediculosis (head lice), a multi-billion dollar, increasingly resistant problem afflicting some 25% of children by the time they are teenagers.

TECHNOLOGY

CASPeR has developed a device, the LouseBuster™, which is a revolutionary new approach for eradicating head lice. By rapidly desiccating (drying) the lice out with blasts of warm air applied to the scalp, the Lousebuster kills lice and their nits (eggs) without using powerful chemicals. The LouseBuster™ blows more than twice as much air as a standard blow dryer, but at a slightly cooler temperature. The person administering the treatment uses a fine tooth comb to lift the hair so that the air can reach the lice and nits, which usually die in less than 30 seconds. Notably, the LouseBuster™ also kills the nits, which shampoos have never been able to do. A successful whole-head treatment usually takes less than 30 minutes and has been shown to be effective in Florida, a humid environment as well as the dry Utah environment.

ACCOMPLISHMENTS

CASPeR completed the development of the beta prototype and has tested a hand-held prototype of the LouseBuster™ that may be available in the future for serial treatments. In addition, consumable treatment kits have been developed.

The LouseBuster™ technology has been licensed to a Center spinout company, Larada Sciences Inc, and relationships have been built with 5 school districts encompassing 205 elementary schools. CASPeR also filed a new patent application and received $300,000 in funding from the NSF.

The Center's technology has received worldwide recognition, and has been featured on all major network news programs, as well as in major publications such as the New York Times, London Times, LA Times, Pediatrics Journal, and WebMD.com.

THINK TANK

What if there was...

A one-step treatment that completely eradicates head lice and their eggs without chemicals?

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Computational Design and Testing

U N I V E R S I T Y O F U T A H

CENTER

The Center for Computational Design and Testing (CCDT) is focused on the commercialization of computational engines that facilitate and accelerate the design and testing of novel materials and devices, particularly those in semiconductors and nanotechnology.

TECHNOLOGY

The CCDT's core technology includes two computational engines: the Materials Designer (MaDes) and Device Simulator (DeSim). MaDes predicts the structural and mechanical properties of new materials based on first principles analysis (without assumptions) at the level of atomic forces, while DeSim models the electrical properties and performance of components constructed with novel materials.

New materials are typically designed and tested in a laboratory, costing up to a million dollars and taking years to develop. Computational design and testing significantly reduces the costs and time, permitting design and testing with a few thousand dollars and a couple of months. The need for this technology is increasing as devices are miniaturized and new materials invented.

ACCOMPLISHMENTS

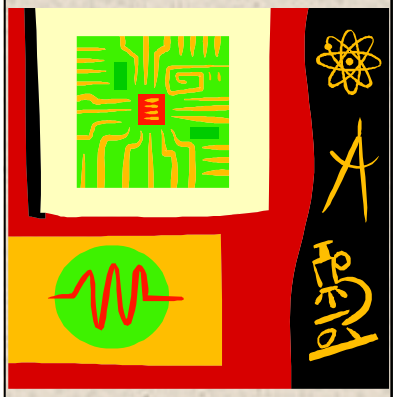
In its third and final year of funding, the CCDT continues to finalize the development of its two computational engines and was awarded $30,000 from a Utah company to characterize properties of a silicon wafer using MaDes. The CCDT's other technology, DeSim, also has many applications in the electronics industry, such as in nano-electro-mechanical systems (NEMSs).

The Center has also developed several web-based computational applications for prediction of crystal properties and simulating the growth of a thin film.

THINK TANK

What if there was...

A way to determine the properties of a new component, such as a semiconductor, before it is even built?



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Global Knowledge Management

U N I V E R S I T Y O F U T A H

CENTER

The Global Knowledge Management Center (GKMC) was formed in 2003 to create products and services based on data mining and optimization methods that enhance and sustain customer service and satisfaction. GKMC's main focus is web optimization, but the technology may be expanded to include homeland security, bio-medical, financial and marketing applications.

TECHNOLOGY

The core technology of GKMC is based on pattern recognition and in the web optimization arena, these algorithms are capable of analyzing data contained in web logs. From the patterns recognized, specific business recommendations may be made to improve the design and usability of the website.

As companies grow and their websites expand, customers have a more difficult time trying to access the information they need quickly. GKMC's technology has been demonstrated to improve a company's website by 600– 800%. The Center's technology is the first to specifically address portal link selection, providing solutions that allow a customer to minimize the amount of links needed to click through to get to the desired information.

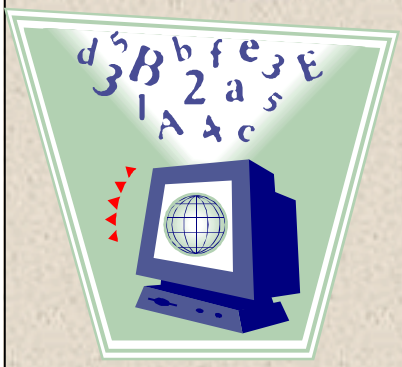
ACCOMPLISHMENTS

In its third and final year, the Center has created a spinout based on the Aculink software, Aculus, LLC. GKMC has also successfully validated the Aculink software with several industry partners and is working with large web companies to evaluate potential web-optimization.

Ongoing technology developments include behavioral profiling and user identification algorithms, as well as voice pattern recognition. The potential for voice pattern recognition lies in web-based customer service that incorporates voice technology, enhancing the customer's experience.

THINK TANK

What if there was...



A way for companies to optimize their websites so that customers may find what they need in only 2 clicks?

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High-Speed Information Processing

UTAH STATE UNIVERSITY

CENTER

The Center for High-Speed Information Processing (CHIP) bridges the gap between university research in fast signal processing algorithms and industrial applications through software and hardware design and prototyping. CHIP's demonstrable prototypes provide companies the proof-of-concept they often require before licensing a signal processing algorithm. Applications of this technology include high definition television, hearing aids, mobile phones, image processing, space craft instrumentation, and digital receivers and transmitters.

TECHNOLOGY

CHIP's emphasis in signal processing has been the implementation of FPGA (Field Programmable Gate Array) chips. Integrated circuits (IC), or chips, function by performing many additions, subtractions, and multiplications. The Center's algorithms relieve the bottleneck in the computational speed of ICs by eliminating multipliers. This results in less power consumption, smaller chip areas, less logic gates, and faster speeds.

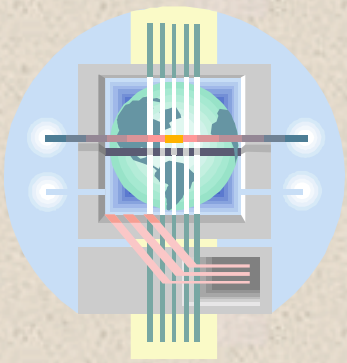
The multiplier-free algorithms have been implemented in the compression and restoration of hyperspectral images. These images are commonly taken by airborne or space imagers at multiple frequencies which results in noise and lost samples that need to be restored as well as very large files that need to be compressed. CHIP's fast algorithms have also been implemented in FPGA chips for the use of feedback cancellation technology in digital hearing aids as well as echo cancellation technology in telephones.

ACCOMPLISHMENTS

CHIP has been issued two patents for its echo cancellation technology and has licensed the technology to Sonic Innovations (SLC, Utah) for use in digital hearing aids and SP Communications (Logan, Utah) for use in speaker phones. The Center has also completed contract work with two other companies. In its final year, CHIP secured $678,000 in external funding to continue its research.

THINK TANK

What if there was...



A way to eliminate echoes in hearing aids and telephones simply by using a fast signal processing algorithm?

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Homogeneous DNA Analysis

U N I V E R S I T Y O F U T A H

CENTER

The focus of this Center continues to be commercialization of rapid and cost-effective DNA-testing. Their technology is based on the Nobel-prize winning technique, polymerase chain reaction (PCR), which has been modified to be ten times faster. The technology takes advantage of the fact that different types of DNA (from different individuals) melt differently. The Center's technology simplifies the whole analysis by allowing for PCR and typing (DNA melting) to be performed in the same test tube, reducing the cost and risk of contamination.

TECHNOLOGY

The core technology of this Center is based on high resolution DNA melting. Just as high definition television presents such detail that it is possible to see the pores on a person's face, high resolution DNA melting provides great detail, enabling one to see the smallest difference in DNA, the base. The technology also allows for this analysis in just a few minutes, providing potential in-office clinical applications such as identifying a patient's risk for drug reactions or what microorganism is causing an infection. The process is "real-time" when a fluorescent dye is added, allowing one to watch the DNA as it melts and is amplified.

After successful commercialization of one product, the Center is working to develop advanced methods of homogenous DNA analysis in addition to software and hardware complimentary technologies. Future developments will include a real-time PCR chip and related instruments.

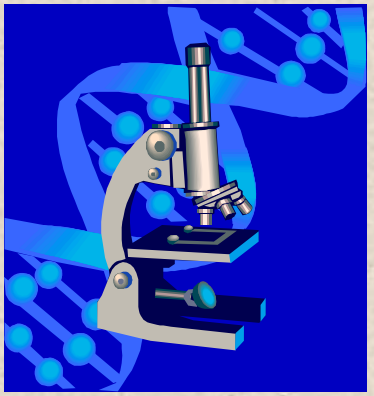
ACCOMPLISHMENTS

This year, the Center demonstrated the feasibility of sequencing and repeat typing by melting and completed a blind clinical trial of transplant matching. Software tools for assay design and analysis have also been developed which will be available on the Center's website to increase visibility of the technology.

An additional patent has been issued and was licensed to the Center's main benefiting company, Idaho Technology. Additional genotyping and allele fractions technology have also been successfully licensed.

THINK TANK

What if there was a way to...



Find out how a patient's body will react to a drug in just a few minutes, right in the doctor's office?

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Interactive Ray-Tracing & Photo-Realistic Visualization

U N I V E R S I T Y O F U T A H

CENTER

This new Center is developing technology for interactively visualizing 3D graphics based on large-scale models and datasets such as those in computer-aided design (CAD) and film animation that current graphics processing units (GPUs) cannot display. The Center plans on improving and integrating their ray tracing programs for commercial use, which are better suited than current GPUs for large-scale applications.

TECHNOLOGY

Two primary software packages are the focus of the Center's commercialization efforts: Manta Interactive Ray-Tracing and Galileo High Quality Batch Rendering. Manta allows interactivity for large datasets with high image quality and Galileo creates high fidelity images such as those used in virtual prototypes or motion pictures.

Complex geometric models such as airplane designs are typically rendered on a screen by projecting each of the billions of 3D objects, a slow process. Ray tracing reverses the process by determining what is seen through each pixel on the screen, thereby dramatically increasing the speed of visualization. By creating better algorithms, modern hardware can still be used to produce highly realistic rendering. The technology may be applied in CAD areas such as automobile and aircraft design as well as the computer animation industry.

ACCOMPLISHMENTS

The Center generated interest in the Manta system after its demonstration at the 2005 SuperComputing conference in which a large aircraft model was presented as remote engineers collaborated on the model. In addition, the Manta software publication in an international conference was selected as one of the four best from the conference.

During this past year, the Center was awarded an $810,000 federal grant and began work on its intellectual property portfolio. Currently, the Center is working on securing a relationship with an auto designer and will also pursue relationships with major film studios.

THINK TANK

What if there was a way to...

Visualize highly detailed 3D graphics on current hardware systems with the use of better algorithms?

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Magnetic Sensor & Actuator Materials

U N I V E R S I T Y O F U T A H

CENTER

The focus of this Center is the development and commercialization of products and processing techniques based on novel magnetic materials for sensors and actuators. The Center is located in a state of the art research and development laboratory responsible for the major discovery of magnetostriction in iron-gallium alloys.

TECHNOLOGY

The cornerstone of the Center's technology is the magnetostrictive iron-gallium (FeGa) alloy. Magnetostrictive materials are used as sensors and actuators because of their ability to change shape and elasticity in response to a magnetic field. Current magnetostrictive materials such as Terfenol-D are expensive, brittle and have a narrow operating temperature. The Center's technology improves upon these areas with FeGa, which is inexpensive, rugged and deformable, and has a wide range of operating temperatures.

Applications of the technology include high power ultrasonic and sonic devices, nano-positioners, sonar and acoustic devices, anti-lock braking systems, position and level sensors, and strain/load sensors. The applications cover many industries, such as medical, instrumentation, automotive, and aerospace.

ACCOMPLISHMENTS

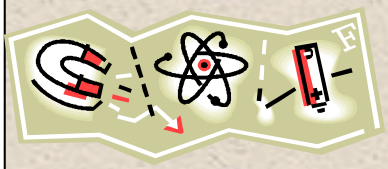
The Center has made progress building a prototype of an industrial ultrasonic cleaner and is testing the prototype of a nano-positioning/actuating device.

In its first year, the Center received $142,370 in funding from the NSF as well as $68,928 in private funding. The Center also filed two patent applications. Their technology was recognized as a finalist for the Stoel Rives Innovation awards for 2006.

Multiple companies have expressed interest in licensing the technology, which was developed in conjunction with Naval contracts. There are currently no manufacturers of FeGa.

THINK TANK

What if there was...



A material that could be used in sonar, positioners, and sensors that resists corrosion and can operate at nearly any temperature?

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Microarray Technology

UNIVERSITY OF UTAH

CENTER

The Center for Microarray Technology (CMT), a new Center this year, is developing technology related to real-time microarrays. This technology includes a metallic microarray substrate in which the probe molecules are bound in nanocavities. The cavities serve as detection sites providing improved sensitivity and increased fluorescence yield. Target application areas include discovery and clinical diagnostics. The goals of the Center are to improve the speed and data quality over traditional microarray technologies and methodologies by increasing sensitivity and selectivity, and through the development of sophisticated analysis methods.

TECHNOLOGY

In its first year of Centers of Excellence funding, CMT's technology developments include DNA amplification and detection on a microarray surface, a method for detection of unlabeled molecules on microarrays, the use of nanocavities to improve nucleic acid or peptide synthesis, and the use of localized temperature control on a microarray surface to selectively immobilize nucleic acids.

ACCOMPLISHMENTS

In the past year, the Center has received over $207,000 in external funds, has filed one patent application, and is in the process of creating a spinout, Philotek. The Center has developed a method of rapid prototyping for the fabrication of its nanocavity microarrays. Optimization of the nanocavity shape is ongoing but current geometries more than double the enhancement over preliminary results. In combination with nanocavity design, the related surface chemistry for molecule attachment has been characterized into an industry-standard and adapted to the nanocavity arrays. The Center is discussing a manufacturing partnership with another Centers of Excellence spinout, MOXTEK, to produce the nanocavity substrate.

In addition, new real-time analysis methods of microarrays are being developed to improve data quality and the range of data capture. The Center is also now using the microheater chips that it designed to control the surface temperature on microarrays.

THINK TANK

What if there was a way to...

Detect molecules with better sensitivity on a microarray in real-time?

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Miniature Unmanned Air Vehicles

BRIGHAM YOUNG UNIVERSITY

CENTER

The main focus of the Center is the development of technologies to extend the capabilities of autonomous miniature air vehicles (AMAVs, also referred to as UAVs) and to license those technologies which are commercially viable. Current UAV technology is large, expensive, hard to fly, and can only be produced in small quantities. The Center's technology provides great improvement with small, inexpensive, easy to fly UAVs that can be mass produced. The vision of the Center is to enable AMAV's to realize their potential in a wide array of commercial markets due to their ease of deployment, flight and cost advantages.

TECHNOLOGY

The Center is advancing a variety of technologies centered on the AMAV. They have extended the capabilities of their previously developed autopilot technology to include auto-takeoff and auto-land, enabling each AMAV to be completely autonomous, eliminating the need for radio control.

In addition to new technologies such as a pan and tilt camera and hand-held user interface, the Center is developing vector field-precision path following capabilities as well as vertical take-off flight control for rotorcraft and tail sitter vehicles. New airframes have also been developed that are inexpensive and include an integrated camera.

ACCOMPLISHMENTS

This year, the Center spun out a second company, Flying Sensors (Bountiful, UT), and filed two additional patent applications for their video stabilization and target location software. Flying Sensors develops commercial applications for small UAVs in areas such as real estate and facility monitoring. Additional technology has been licensed to the Center's first spinout, Procerus Technologies, and the pan-tilt camera system and hand-held user interface are now ready for licensing.

The Center continues to receive recognition for its work and co-directors, Randy Beard and Tim McLain, were awarded the Brigham Young University Technology Transfer Award.

THINK TANK

What if there was...

A miniature plane that could be flown to monitor traffic without the need to leave the office?

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Modified Activated Carbon

UNIVERSITY OF UTAH

CENTER

The Center for Modified and Activated Carbons Technology (MAC) focuses on modifications to existing activated carbon products and expanding into new products. Through chemical or biological modifications, activated carbon is modified at the molecular or surface level to enhance its sorption properties for treatment and purification of water or other liquids.

TECHNOLOGY

MAC's technology is centered around modified activated carbon which provides faster sorption, longer life, higher loading capacity, and better contamination removal for less cost than typical technologies. Compared with water treatment technologies such as reverse osmosis or activated alumina, modified activated carbon has a smaller treatment time, can operate over a larger pH range, is less expensive, and is able to remove more arsenic.

MAC's technology has applications such as mining, and water treatment in a broad range of industries including chemical plants, refineries, agriculture, medical, food and beverage, and analysis.

In its first year, the Center tested the use of the carbons in arsenic removal as well as zinc, cadmium, and copper removal. A number of metal binding proteins were also successfully tested with activated carbons.

ACCOMPLISHMENTS

MAC has already spun out a new company, INOTEC, with four products that it is marketing. Discussions are underway with major mining companies and prototype materials for arsenic removal are being tested. Pre-prototype materials and services have been requested by five different mining companies who are now customers of INOTEC. In addition, pilot-scale testing of MAC materials for removal of arsenic from drinking water is scheduled for New Mexico and is pending approval in Park City.

The Center received $465,349 in funding and has two patent applications filed.

THINK TANK

What if there was...

A material that could completely remove contaminants from water in just a couple of hours for a tenth of the cost that current treatments require?

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Nanosize Inorganic Material Powders

UNIVERSITY OF UTAH

CENTER

The main focus of this Center is to synthesize nanosize oxide powders by a low-cost, commercially scalable process using inexpensive precursors. There are numerous applications for these powders, including fuel cells, catalysts, and sensors.

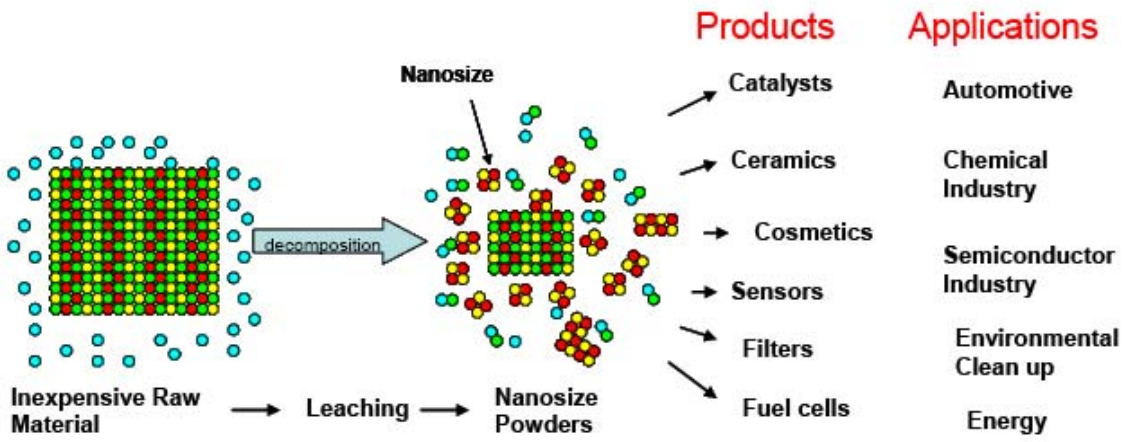
TECHNOLOGY

The Center's core technology is based on molecular decomposition to create nanosize powders, which creates a uniform size of various composition and is less expensive than conventional molecular addition techniques. This allows the technology to be used in the application of sensors, which competitors have not yet been able to accomplish.

THINK TANK

What if there was...

A way to make highly responsive sensors from inexpensive nanosize powders?



ACCOMPLISHMENTS

The Center has synthesized several new nanosize powders, including CSZ, YSZ, SnO_2, Fe_2O_3, Fe_3O_4, and In_2O_3. In addition, the Center has successfully fabricated sintered parts of selected nano materials, metallic and ceramic membranes, and nanoporous sensors.

This year, the Center's Director received the Governor's Medal of Science and Technology and a new spinout was created, Nano-Oxides, Inc.

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Therapeutic Biomaterials

U N I V E R S I T Y O F U T A H

Center

The Center for Therapeutic Biomaterials (CTB) prepares and uses new biomaterials for reparative medicine and the 3-D culture of human cells. Applications include clinical use in wound repair, prevention of post-surgical adhesions, and extending the life of donated organs as well as evaluation of cell response to various compounds. The biomaterials also have many non-medical applications, such as cosmetics.

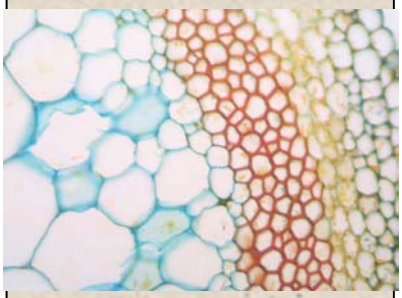
TECHNOLOGY

The CTB continues to build upon its core technology – synthetic extracellular matrix (sECM). In healthy tissue, the extracellular matrix (ECM) provides support for cells and regulates intercellular communication. After an injury, the repair process often leads to the formation of scar tissue rather than the appropriate new ECM. The sECM aids the repair process, leading to new healthy tissue. This technology has been licensed to three companies in three different fields (human, veterinary, and research). New applications include tympanic membrane repair, controlled release of steroids for reduction of inflammation, and the growth of stem cells. In addition, sECM is being used to grow "personalized" tumors for testing anti-cancer drugs that are optimized for the patient. The Center is also developing hybrid materials that combine demineralized bone matrix with sECM for repair of large bone defects.

ACCOMPLISHMENTS

In its second year, the CTB now has three spinouts (Sentrx Animal Care, Carbylan BioSurgery, and Glycosan Biosystems) and is working on additional new technologies including opportunities for human drug toxicology and improved bioprocessing protocols. Two new patent applications have also been filed. The CTB received $1,606,000 in funding from the NIH.

The Center's director, Dr. Prestwich, was selected as one of vSpring's v100: Top 100 Entrepreneurs, Utah Business Magazines "Health Care Heroes," and received the TIAA-CREF Greater Good Award. The sECM technology has been featured by KSL News, Science News, and Discover magazine.



THINK TANK

What if there was...

A material that mimics natural tissue that can be used to treat chronic wounds and repair bone defects?

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Titanium Boride Surface Hardening

U N I V E R S I T Y O F U T A H

CENTER

The focus of this Center is commercialization of a variety of materials using titanium monoboride (TiB) in applications requiring excellent corrosion and wear resistance. Traditionally, titanium diboride has been used in these applications, but the high cost and manufacturing difficulty have been limiting. Titanium monoboride has the unique advantage of combining similar corrosion and wear resistance in addition to electrical conductivity with less expensive manufacturing techniques. The nanostructured bulk titanium boride and the functionally graded titanium boride are novel material technologies for innovative applications such as armor, medical devices, electrodes, gun barrels and die inserts.

TECHNOLOGY

The Center has three major technologies involving its novel TiB: the incorporation of TiB crystals to harden the surfaces of titanium; creation of nanostructured titanium boride bulk material; and functionally graded titanium boride materials for high performance components and devices.

TiB-hardened surfaces provide great advantages over current materials in biomedical implant devices and bearings and gears, reducing contamination problems and increasing the stiffness-to-weight ratio. The functionally graded TiB provides advantages in armor and gun barrel systems, offering a fracture-resistant, highly-graded material.

ACCOMPLISHMENTS

Now in its third year, the Center is continuing to improve the nanostructured titanium boride material and expects approval of its patent in early 2007. The Center also continues to work with its benefiting company, Ortho Development Corporation, and is now pursuing non-medical applications for its technology. With successful development of a ballistic test apparatus and armor plates now complete, the Center is looking into the establishment of a spinout for manufacturing and consulting services.

THINK TANK

What if there was...

An inexpensive material with superior corrosion resistance that could be used in armor and medical devices?

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2005-2006 Business Team Recipients

Acoustic Cooling

U N I V E R S I T Y O F U T A H

CENTER

The Center for Acoustic Cooling Technology was originally established to commercialize novel high frequency thermoacoustic engines for cooling applications. One important application for this technology is in the heat management of computers and other devices employing dense arrays of microcircuits. Subsequent work has resulted in the demonstration of a prototype device capable of converting waste heat into electricity at high efficiency.

TECHNOLOGY

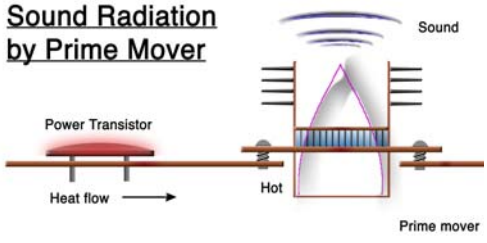
The Center's technology is based on two effects in thermo- acoustics: first, that heat generates sound that can be converted into electricity and second, that sound can pump heat. These effects have been employed in development of thermoacoustic engines which have no moving parts, are environmentally safe, and efficient. Both acoustic coolers and prime movers (energy converters) have been developed with dimensions ranging from 4 cm to 0.8 cm. Technology improvements have increased the power of the acoustic cooler 10 times.

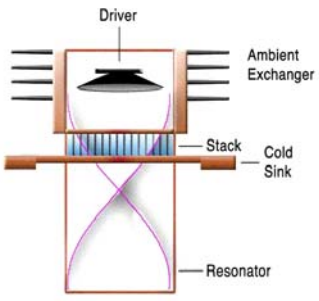
The Center is working to expand the capabilities of the thermoacoustic engines to a larger scale by developing arrays.

ACCOMPLISHMENTS

This year, the Center has expanded the energy conversion efforts. Prototype device power has been increased by a factor of 20. The success of these prototypes is leading to promising applications in renewable energy from waste heat. A prototype of an ultrasonic cooler was also developed.

The Center holds two patents for its technology and has filed an additional patent application. During the past year, the Center received $1.2 million in federal funding.





THINK TANK

What if there was...

A miniature device that could fit inside a computer and convert heat into energy?

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CONTROL OF FLOW IN MANUFACTURING

UTAH STATE UNIVERSITY

CENTER

This new Center is focused on the application of flow control technologies, commonly studied for aerospace applications, to manufacturing processes. Controlling flows in manufacturing leads to higher throughput and improved accuracy, speed, and product quality.

TECHNOLOGY

The Center has two core technologies in development: a particle sorting technology called Aerodynamic Vectoring Particle Sorting (AVPS), and a method to improve spray processes called Coanda-assisted Spray Manipulation (CSM).

AVPS is able to sort different-sized particles without contact by taking advantage of the different forces applied to the particles when the direction of flow is changed. This technology has many applications including biotechnology, cement industry, cosmetics, environmental, and the aerospace industry.

CSM allows control of the direction and profile of high-speed jets or sprays with high precision and frequency. This technology makes use of an enhanced Coanda effect (the tendency of jets to adhere to nearby surfaces) and makes it possible to apply films on large surfaces at precisely controllable thicknesses with only a single nozzle and no moving parts in or near the jet flow. When used in flame spray processes, the technology mitigates the intense heating of the surface that is typical of flame sprays.

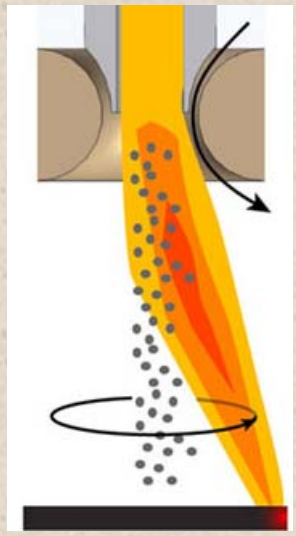
ACCOMPLISHMENTS

In 2005, the Center was awarded a business team to assist in preparation for a full Center proposal. Through that collaboration, the Center was successful and awarded full Center status for the 2006-07 year. In its first year, the Center has secured commitments from two companies, to assist in testing of future CSM devices applied to paint sprayers. The Center has 2 patents and 4 invention disclosures. A small business company, CastleRock Engineering, has spun out from the Center and is partnered in STTR/SBIR proposals submitted by the Center. One such proposal that is soon to be submitted will bring $500,000 in funding if successful.

THINK TANK

What if there was...

A way to separate particles just by spraying them or reducing the heat of surfaces that are coated with flame sprays?



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Direct Machining and Control

BRIGHAM YOUNG UNIVERSITY

CENTER

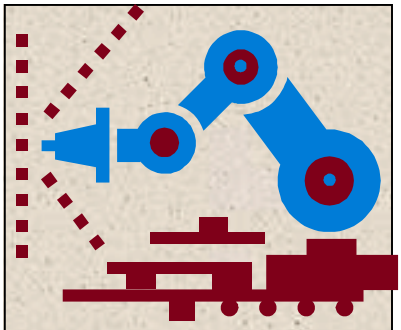
The Center for Direct Machining and Control (DMAC) was funded by the COEP from 2002 to 2005 to develop a centralized, PC-based, direct-control manufacturing system enabling multiple machine tools to be run by one operator through a network, rather than individual operators, delivering dramatic cost savings. The technology has applications in multiple manufacturing and automation industries.

TECHNOLOGY

The DMAC technology is based on an open architecture controller and supporting algorithms for general control of mechanisms such as 5-axis machine tools. The primary focus in the Center is software development, including object oriented libraries that integrate motion planning, trajectory generation, servo-control, communication and user interfaces, with some supporting hardware. Hardware includes dual CPU control processors, machine tool enabled Coordinate Measurement wireless hardware, and Ethernet enabled sensor boards and motor control boards. The advantage of this new distributed approach to control is reduced hardware and control costs, control of distributed rather than collected devices, and greater flexibility through modern control methods that cannot be enabled under the current restrictions of modern controllers.

ACCOMPLISHMENTS

DMAC has developed a number of technologies including direct control architecture and a closed-loop machining scheme. Direct Controls, Inc., a spin-off company in Orem, Utah, has released the first direct controlled machining robot. The Center is working with a business team on continuing commercialization work.



THINK TANK

What if there was...

A way for one person to operate multiple machines for the control of manufacturing with a single computer?

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Program Description

PROGRAM DESCRIPTION

BACKGROUND

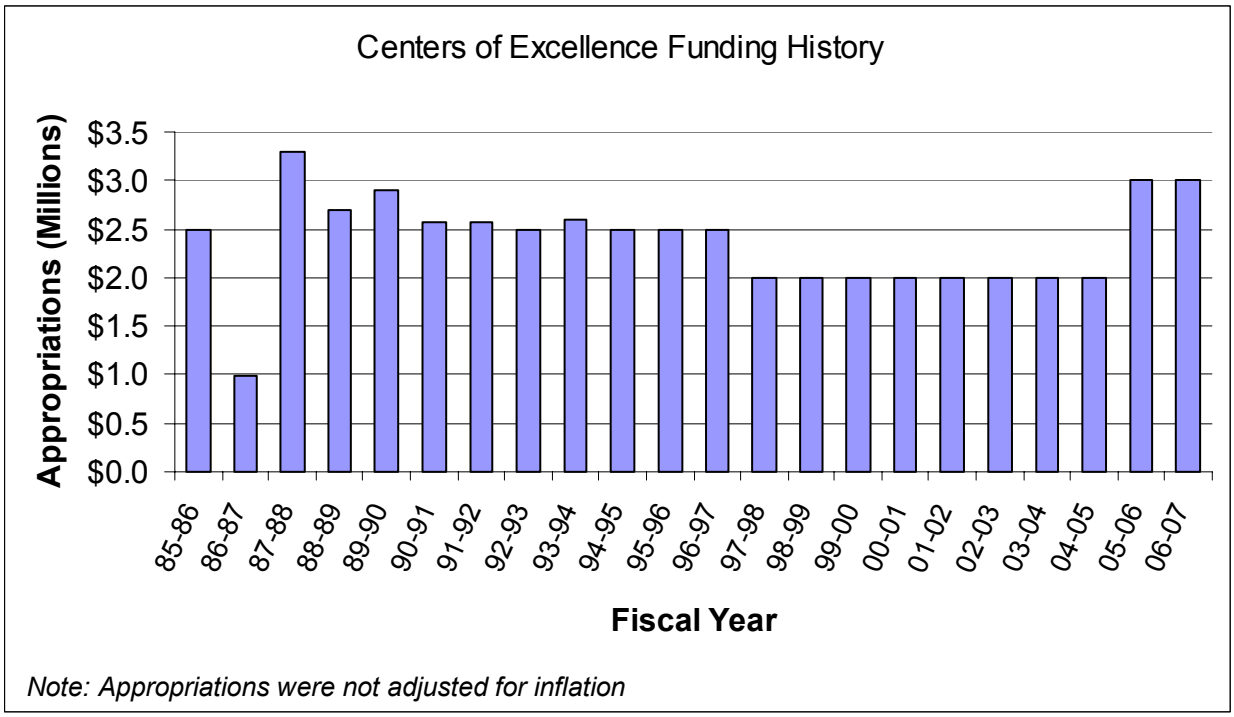
Twenty years ago, in 1986, the Utah State Legislature recognized the importance of a technology based economy and created the Centers of Excellence program to assist the transition of technologies out of Utah's Colleges and Universities and into industry. The Legislature has recommended the allocation of economic development funds annually to the COEP, to be awarded to college and university faculty on a competitive basis. The COE Program has two key functions: first to help technically mature university developed technology and second to help transition those mature technologies into industry.

The COE program is a direct granting program, and the state does not take or hold an equity position in the licenses. The return on investment to the state comes solely from the success of helping to convert university developed technologies into jobs and wealth-creating products and services in successful businesses. This feature is of tremendous benefit to the universities, which retain title to the technologies, and the licensees, such as startups or existing Utah companies, which reap the benefits of these funds. However, because of this feature, during the 2006 Legislative session, the Legislature passed a bill, Senate Bill 112, which adds a "return of grant" feature to the COE statute, to help strengthen the program and assist the state in receiving a return on its investment.

Over the years, the funding for the COE program has varied, beginning at $2.5million in 1986, increasing to $3.3 million for 1987-88 and declining to between $2 and $2.5 million for most of the program's history. For the 2005-06 fiscal year, funding was increased significantly from $2million to $3million, and during the 2006 Legislative session, COE funding was set to $3million per year on an ongoing basis.

This level of funding permitted the program to fund 18 full Centers and to provide business team assistance to 3 other teams during the 2005-06 fiscal year. The same level of funding will support 16 full Centers and 5 business teams for 2006-07, with additional funding available for emerging teams to apply for first time business team assistance in the fall of 2006.

If funding for the Centers of Excellence program had kept pace with inflation (see bls.gov/cpi) since its inception in the 1985-86 fiscal year, the funding level for 2006 would be nearly $4.6 million. The chart below shows the history of funding for the COE program through fiscal 2006-07 allocated funds.



Note: Appropriations were not adjusted for inflation

HISTORICAL SUCCESS

The Centers of Excellence program has been a part of the university/industry technology landscape in Utah for 20 years. One way to measure the success and impact of the program is to look at the economic impact of spinouts which are startups emerging from a Center.

It is very difficult to track the jobs that have derived from over 100 Centers of Excellence over nearly 20 years, but in 2003, under the Leavitt administration, the Centers of Excellence program conducted a small survey to attempt to quantify jobs resulting from the program with a particular emphasis on spinouts from the various Centers. This survey focused on companies linked to about 45 Centers and showed a count of 2,008 jobs stemming from spinouts and licensees of Centers of Excellence.

To update this data and make it current and more complete, during the Summer of 2006, the COE program conducted an extensive survey of the past Center participants, eventually reaching over 80 of the 111 Centers who participated in the program over the past 2 decades. Details of this study can be found in the "Centers of Excellence 20th Anniversary Report".

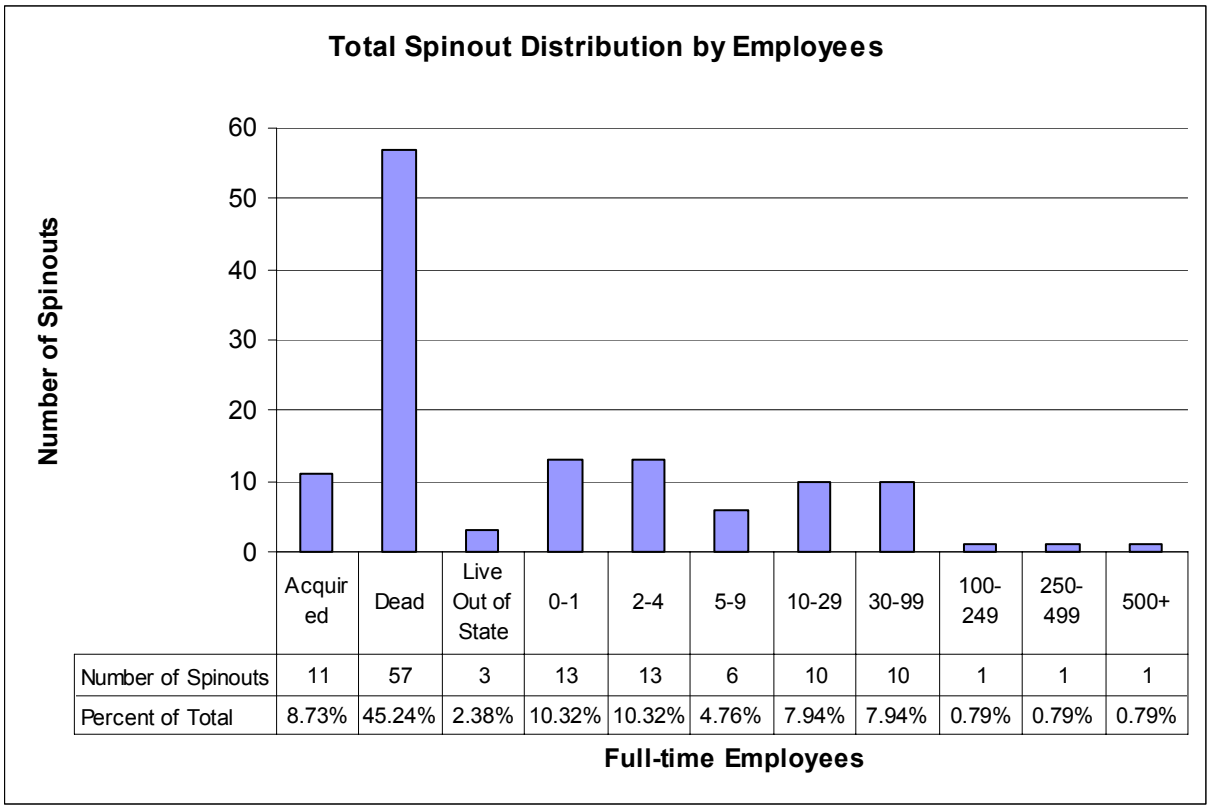
The depth of this research revealed some important information. The thoroughness of the 20th Anniversary survey permits this 2006 data to serve as an excellent baseline for the COE program and its long term performance.

As part of this survey, detailed data was gathered on the number of employees of these spinouts, as well as, where obtainable, average salary of employees and revenues of the company. The 2006 data revealed that over 2000 jobs are currently in Utah based at companies that have emerged from the Centers of Excellence program and, based on reported data, the average salary at reporting spinouts is over $65,000 per year, more than double the current Salt Lake County median salary.

In addition, errors in the 2003 data were identified and adjusted for. During the 2003 survey, several companies were included as "spinouts" which were actually not spinouts of the Centers program, but were "benefiting companies." A benefiting company is a firm which already existed when during the life of the Center and in some way partnered with the Center such as sponsoring research, using consulting services etc.

Based on the 2006 survey, data adjustments were made to correct the 2003 totals and therefore the adjusted 2003 number is 1071 jobs created by confirmed Centers of Excellence spinouts by 2003.

A graph of the data of the employees of spinouts as collected in the 2006 20th Anniversary report is enlightening and is shown below.



	Acquired	Dead	Live Out of State	0-1	2-4	5-9	10-29	30-99	100-249	250-499	500+
Number of Spinouts	11	57	3	13	13	6	10	10	1	1	1
Percent of Total	8.73%	45.24%	2.38%	10.32%	10.32%	4.76%	7.94%	7.94%	0.79%	0.79%	0.79%

The companies listed as "Acquired" are those that were acquired and their jobs essentially eliminated in Utah. Acquired firms which are still active employers in Utah are included in the categories by number of Utah employees in the appropriate category. The 57 firms assigned to the "Dead" category are those which are no longer active or viable based on feedback from both the Center Directors and company participants. IN addition, another 32 companies have less than 10 employees, many of which have become "stuck" at this level. However a healthy 23 out of the 60 active spinouts have between 10 and 99 employees, and one company falls into each of the categories of 100-249, 250-299, and 500+ employees. Obviously the hope of the state is that an increasing percentage of our COE spinouts could grow to be included in the category of 500+ employees.

Changes made during the 2005-06 fiscal year are designed to help emerging COE spinouts gain the momentum needed to achieve this type of long term success. In particular these changes (described in the section on new policies), permit the Center to continue to be eligible for COE funding even if it has a companion spinout or licensee, until an arms length transaction of at least $500,000 is completed. This transaction can be an investment or contracts/sales. These changes permit a "parallel" structure to the program so that a spinout can operate in parallel with the university work to gain momentum for the commercial efforts.

Crucially, an enhanced business team program, which recruits seasoned business executives and serial entrepreneurs to help the Centers on a consulting basis, was incorporated into the Centers of Excellence program and is more fully described in the Commercialization section.

OPERATIONS AND OBJECTIVES — "OUR JOB IS JOBS"

The Centers of Excellence program is an economic development program, designed to help enhance the growth of Utah's technology based economy. Technology that is matured with Centers of Excellence funds is hoped to be licensed to either an existing Utah business or a startup or a new company (often called a spinout), specifically to take a new technology to market. The program continues to mentor Centers who have graduated, where possible, to help foster success, introduce them to sources of funding, and identify management and other talent that might be of help to the Center.

Under the statute governing the 2005-06 funding year, Centers are required to have 2:1 matching funds. These funds are reported and reviewed on a regular basis. A key element of the program is the emphasis during the renewal and selection process of achievement of milestones and commitment to commercialization. During the 2006 Legislative session, modifications were made to the statute to permit colleges or universities in Utah that do not grant doctoral degrees to use a 1:1 matching ratio. More details about this can be found in the section on the new Legislation.

Center directors are required to submit annual reports to the COEP director. This Centers of Excellence Program Annual Report begins with a summary of the reports prepared by each Center Director and is supplemented, as appropriate, by information gathered from site visits, meetings, and other sources.

Prior to the 2005-06 fiscal year, Centers were eligible for funding for up to 5 year, but for the first time in 2005-06, were eligible for a maximum of 4 years. The goal of this change was to deploy approximately the same total amount of funds, typically between $500,000 and $750,000 per Center, while accelerating the commercialization of the technology.

CENTER SELECTION PROCESS

The Center selection process is one of the great strengths of this program. Each year, in late December, the COE Director issues the new solicitation for the upcoming fiscal year. This opportunity is communicated to the State's colleges and universities, including the relevant technology commercialization offices, existing and past Center Directors, various department heads, industry contacts and on the Centers of Excellence Website.

For the 2005-06 fiscal year, one type of proposal was available, however, once the proposals were received, several were recommended for a new type of support, called a "Business Team Grant". This grant does not award money to the university team directly, but instead uses state funds to recruit seasoned business team members who are serial entrepreneurs and seasoned technology executives, to assist the university team in preparing a compelling, market focused proposal.

This was so successful during the 2005-06 year, that for the 2006-07 solicitation, three types of proposal options were created. First, a renewal proposal, second a proposal for a new Center, and third, a proposal for a business team grant.

Once the proposal deadline has passed, the review process begins. The Center Director recruits experienced executives in Utah's technology community to serve as reviewers, often referred to as a group as the "Centers of Excellence Advisory Council." Barring any unusual circumstances, the proposing teams has an in-person meeting with two or more reviewers and a member of the GOED team, usually the COE Director. During these review meetings, which usually last 1.5 to 2 hours, the team explains their technology and research to date, and outlines how these innovations might apply to one or more markets. The reviewers, who are chosen based on their relevant market and technology expertise, are able to interact with the proposing team, ask questions and evaluate the commercial potential of the proposal.

For 2005-06, once all of the reviews were complete, all of the members of the Advisory Council were invited to a 1 1/2 day offsite meeting to do the hard work of selecting those proposals which best fit the funding criteria. This is a lengthy and intellectually demanding process and every member of the Council is keenly aware that these funds are taxpayer funds and they are careful to select only those Centers with demonstrable market potential.

The State Advisory Council for Science and Technology (SAC) is specified in statute to have advisory responsibility for the Centers of Excellence Program. SAC members participate on the Centers Advisory Council, reviewing proposals and conducting site visits, thus gaining detailed knowledge of the quality of the proposals as well as the process itself. This oversight is an important mechanism for ensuring quality decisions. In statute the SAC is also charged with helping to prepare the COE annual report.

Also in statute, the GOED Board is chartered with oversight of the program and GOED Board members also participate as reviewers and/or in the COE Advisory council process. They are then able to represent to their colleagues on the Board that the process is appropriately conducted and that the recommendations for funding are appropriate. The summary of statistics from the 2005-06 Solicitation process is listed below.

Proposal Review and Award Summary

Total Number of Proposals to COEP for 2005-2006	**34**
Existing Centers Seeking Renewal	17
Proposals for New Centers	17
Centers Funded	18
Existing Centers Renewed	13
New Centers Funded	5
Centers with Business Team Grants	3
Graduating Centers from 2004-2005 year	5
Centers at the University of Utah	12
Centers at Utah State University	3
Centers at Brigham Young University	3

Funding Summary

Funding for the Centers of Excellent Program	
Estimated Program Overhead (Paid by GOED)	$170,000
Funds Allocated by the Legislature	$3,000,000
Direct Center Funding (Technical Funding to Centers)	$2,446,800
Business Team Funding*	$553,200
* Average estimated funding of approx. $25,000 per Center customized based on Center needs. Paid and Managed by COEP	

COMMERCIALIZATION PROCESS

For many years, the Centers of Excellence program has paid for consultants to assist each Center with business planning and strategy and this has always been a strength of the Centers program. Approximately 80 hours per year of consulting assistance was available to each Center and these funds were administered by each university's Technology Commercialization Office, which received a block grant of funds for each of their Centers. These funds were to be expended on "COE approved" consultants, of which there was a pool of approximately 20. These individuals ranged from general business consultants to some market-specific consultants.

Under the Huntsman administration, for the 2005-06 fiscal year, the consulting program was replaced with the COE Business Team program. This program builds on the concept of business consulting that the program has had but focuses on recruiting industry focused, seasoned technology executives, serial entrepreneurs and market experts who are recruited through a state– and nation-wide RFP to meet the specific needs of each Center. Under the Business Team program, funding has been increased to provide approximately 250 hours of assistance each year to help transfer the technologies out of the university setting and into industry.

The COE Business Team Program has been very successful, with professors, university representative and the business team members themselves frequently commenting on the exciting opportunities available in collaboration between top notch research teams and top notch business people. This program has become a mainstay of the COE program.

2005-2006 Financial Summary

The Financial Summary is a summary of the information provided by each Center in their annual report to the program and the funding summary is based on the funds granted during the fiscal year. For reference, "Total Funding" means COE funding since starting with the program, "Patents Pend. 05-06" means patents newly filed during the fiscal year, "New Patents (Issued)" refers to those issued during the fiscal year and "Spin-Offs/ Licensees" refers to companies which have been formed to "spin-off" technology from the Center while "Licensees" refers to companies which already existed which have licensed the technology.

University	Center	05-06 Funding	Total Funding	05-06 Matching	Patents Pend. 05-06	New Patents (Issued)	Spin-Offs/ Licensees
UU	Acoustic Cooling Technology	25,000	314,000	1,150,000	1	0	0
BYU	Acoustics Research	115,000	115,000	237,376	0	0	0
BYU	Advanced Communications Technology	120,203	230,203	766,211	4	0	0
USU	Advanced Imaging LADAR	143,824	413,724	144,497	1	0	2
USU	Advanced Satellite Manufacturing	139,784	164,784	285,001	2	0	0
UU	Alternate Strategies for Parasite Removal	150,000	285,000	300,000	3	0	1
UU	Biomedical Microfluidics	135,000	255,000	421,000	6	0	1
UU	Computational Design and Testing of Novel Materials	123,500	165,000	325,000	0	0	0
BYU	Control of Flow in Manufacturing	25,000	25,000	0	0	0	0
BYU	Direct Machining & Control	25,000	342,000	0	0	0	0
UU	Global Knowledge Mgmt.	165,000	398,000	330.000	0	0	1
USU	High-Speed Information Processing	139,200	548,700	678,000	0	2	3
UU	Homogeneous DNA Analysis	176,000	470,000	643,750	1	1	1
UU	Interactive Ray-Tracing & Photo-Realistic Visualization	143,700	143,700	809,978	0	0	0
UU	Magnetic Sensor & Acuator Materials	114,000	114,000	211,299	2	0	0
UU	Microarray Technology	100,000	100,000	207,487	0	0	0

University	Center	05-06 Funding	Total Funding	05-06 Matching	Patents Pend. 05-06	New Patents (Issued)	Spin-Offs/ Licensees
BYU	Miniature Unmanned Air Vehicles	130,000	240,000	767,036	1	0	2
UU	Modified Activated Carbons Technology	140,000	140,000	465,355	0	0	0
UU	Nanosize Inorganic Material Powders	106,700	196,700	720,000	1	2	1
UU	Novel TiB Surface Hardening	115,000	272,000	169,000	2	0	1
UU	Therapeutic Biomaterials	160,000	290,000	1,757,000	2	0	3

2006-2007 Funded Centers

Utah Centers of Excellence Program
Description of Centers Selected for Funding in Fiscal 2006-2007
(Dollar amounts subject to minor revision)
List of recommendations for all proposals

Proposals Selected for Funding for the 2006-07 Centers of Excellence Program

Center (University) **Years Funded to Date**

Acoustics Research (BYU) **1**
Commercializing active sound control technology with superior ability to both reduce noise in varied settings (vehicle cabins, computer fans and telecommunications, e.g.) and modify sounds for commercial benefit.

Advanced Communications Technology (BYU) **2**
Improved wireless communications and data transmission for both military and commercial markets is achieved through the use of MIMO (multiple-input multiple-output) technology with multiple antenna elements.

Advanced Imaging LADAR (USU) **3**
Commercializing land-based and airborne high-resolution, laser-based 3D color-imaging platforms for both military and civilian use. One license to RapidMapper, Inc. (now InteliSum), a Utah company.

Advanced Thermal Management Technologies (USU) **NEW**
Developing technologies for extremely high performance thermal management in the context of physical and vibration isolation, in part from collaboration with Utah State University's Space Dynamics Lab.

Biomedical Microfluidics (U/U) **2**
Engineering technology that controls the movement of fluids in channels smaller than a human hair, micropumps that can deliver tiny quantities of drugs, and improved devices for DNA screening are some product examples. Wasatch Microfluidics, Inc., is being spun out. Companion Spinout funding was proposed but was not funded.

Control of Flows in Manufacturing (USU) **New**
Applying Computational Fluid Dynamics to improve manufacturing processes including particle sorting and Electrical Discharge Machining (EDM). This Center was assigned a business team in 2005-06.

Center (University) **Years Funded to Date**

Functionally Graded…Cemented Tungsten Carbide **New**
(Functionally Graded and Designed Cemented Tungsten Carbide and Polycrystalline Diamond Composite Materials) Advanced composite materials with predictable wear and failure characteristics are being designed for demanding applications such as mining, drilling, and grinding.

Homogeneous DNA Analysis (U/U) **3**
Developing a simple and inexpensive method for genotyping DNA samples from patients or disease organisms right in a doctor's office. One application licensed to Idaho Technologies, Inc. (a Utah company).

Interactive Ray-Tracing & Photo-Realistic Visualization (U/U) **1**
Producing a commercial form of two programs that can process 3-D graphics based on large data sets found in CAD, film animation and scientific models, which existing GPUs cannot handle.

Microarray Technology (U/U) **1**
Developing a superior microarray platform for the molecular diagnostics and research markets with improved sensitivity, specificity and throughput.

Miniature Unmanned Air Vehicles (BYU) **2**
Conducting rapid design of airframes and miniaturized autopilot and guidance systems for tiny UAVs that can be operated by novices have earned the attention of both military and civilian agencies. An autopilot design has been licensed to Procerus, Inc. in Utah. A new Companion Spinout, Flying Sensors, is recommended for a Companion Grant.

Companion Spinout – Flying Sensors **New**
Developing commercial (non-military) applications for miniature unmanned air vehicles (UAVs) including real estate, insurance industry, EPA - multi-source air quality sampling, random testing, pipeline/remote facility surveillance and emergency response/fire monitoring – forest & commercial.

Modified Activated Carbons Technology (U/U) **1**
Developing improved products for gas and water treatment, as well as metal recovery or removal, based on modifications to granular activated carbon. This also was a Super Center proposal in combination with SLCC/Innovabio and SUU. The concept was well received, but was not ultimately approved.

Nanosize Inorganic Material Powders (U/U) **3**
Commercializing a novel, cost-effective process (molecular decomposition) for the manufacturing of nanosize powders, the building blocks for myriad nanotechnology applications, as well as nanostructured ceramic membranes and other devices.

Center (University)	Years Funded to Date

Organic Electronics (U/U) **New**

Developing new polymers for the creation of OLEDs (Organic Light Emitting Diodes) resulting in the commercialization of organic semiconductors with superior luminescence efficiency and color spread, for multicolor displays and white light illumination.

Therapeutic Biomaterials (U/U) **2**

Developing applications of biopolymers and hydrogels for clinical use in wound repair, prevention of surgical adhesions, and extending the life of donated organs. Three companies, 1 in California (Carbylan) and 2 in Utah (Sentrx Animal Care and Glycosan Biosciences) have been spun out of the Center to date.

Companion Spinout – Glycosan Biosciences **New**

Commercializing the compounds from Therapeutic Biomaterials for 3-D Cell Culture, Tissue Engineering, Drug Toxicity Testing, & Skin Care.

Titanium Boride Surface Hardening (U/U) **3**

Commercializing harder, longer-lived components and devices – ranging from armor to bearings and orthopedic implants - for the military, biomedical and industrial markets.

Pre-Center Candidates (Assigned a Business Team) for 2006-07 (New Applicants to the COE program)

Cell Therapy (UU)

This Center has capabilities to build a "bank" for stem cells derived from umbilical cord blood (so-called "cord blood") which can be used for many clinical applications in Regenerative Medicine and tissue engineering. Providing GMP and regulatory support for processing, development and commercialization of cord-derived stem cells, biologics and combinational products.

Electronic Mathematics Education (eMath@USU)

Working on the creation and world-wide dissemination of dynamic, computer-based instruction software for K-16 mathematics, including the award winning National Library of Virtual Manipulatives.

MIMO Communications System (UU)

Technologies include new algorithms for signal detection and reception that significantly improve the performance and throughput of MIMO (Multiple-Input Multiple-Output) wireless communication systems. The developed algorithms offer low complexity and near optimal performance, and are adaptable to any standard.

Solar Biofuels Technology (USU)

Developing a solar powered photobioreactor using minimal land and water resources to efficiently grow high-oil-content microalgae as a feedstock for biofuels such as biodiesel.

Universal Application System (USU)

Commercializing a web-based system that processes applications for multiple agencies in the government services industry. This technology is at the basis of "UtahClicks" and is also in production in Oregon and Indiana. Plans to adapt this software for other industries are underway.

Graduating Centers as of June 30, 2006

Alternate Strategies of Parasite Removal (U/U) — 2 years completed

Preparing to commercialize a safe, nontoxic and rapid treatment for Pediculosis (head lice), a multibillion-dollar, increasingly resistant problem afflicting some 25% of children by the time they're teenagers.

High-Speed Information Processing (USU) — 4 years completed

Designing fast algorithms for Application Specific Integrated Circuits, which have value in most military and compact consumer electronic devices. An echo cancellation application enabled the creation of SP Communications, Inc. to make improved speaker phones in Logan, Utah.

Legislation Governing 2005-06

Part 6
Centers of Excellence

9-2-601. Purpose.
(1) The Legislature recognizes that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes. These generally come from strong research colleges and universities. Technical research in Utah's colleges and universities should be enhanced and expanded, particularly in those areas targeted by the state for economic development. Most states are enhancing their research base by direct funding, usually on a matching basis. The purpose of this part is to catalyze and enhance the growth of these technologies by encouraging interdisciplinary research activities in targeted areas. The Legislature recognizes that one source of funding is in matching state funds with federal funds and industrial support to provide the needed new technologies.
(2) The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis.
(3) The Legislature recommends that such funds be allocated on a competitive basis to the various colleges and universities in the state. The funds made available should be used to support interdisciplinary research in specialized Centers of Excellence in technologies that are considered to have potential for economic development in this state.
History: C. 1953, 63-62-1, enacted by L. 1985, ch. 103, § 1; 1986, ch. 109, § 1; renumbered by L. 1992, ch. 241, § 60.

9-2-602. Short title - Definitions.
(1) This part is known as the "Centers of Excellence Act."
(2) As used in this part, "Centers of Excellence" means university-based, industry-supported, cooperative research and development programs.
History: C. 1953, 63-62-2, enacted by L. 1985, ch. 103, § 2; 1986, ch. 109, § 2; renumbered by L. 1992, ch. 241, § 61.

9-2-603. Administration - Grants.
(1) This part shall be administered by the Division of Business and Economic Development.
(2) The department may award grants to the various colleges and universities in the state for the purposes of this part.
(3) Recommendations for funding shall be made by the division with the advice of the State Advisory Council for Science and Technology, with the approval of the board. Each proposal shall receive the best available outside review.
(4) In considering each proposal, the division shall weigh technical merit, the level of matching funds from private and federal sources, and the potential for job creation and economic development. Proposals or consortia that combine and coordinate related research at two or more colleges and universities shall be encouraged.
(5) The State Advisory Council on Science and Technology shall review the activities and progress of individual centers on a regular basis and assist the division in preparing an annual report on the accomplishments and direction of the Centers of Excellence Program.
History: C. 1953, 63-62-3, enacted by L. 1986, ch. 109, § 3; renumbered by L. 1992, ch. 241, § 62.
Repeals and Reenactments. - Laws 1986, ch. 109, § 3 repealed former § 63-62-3, as enacted by L. 1953, ch. 103, § 3, relating to creation of a committee for technology excellence in engineering research, and enacted the above section.
[92603].
6338f704.

Legislation Passed in 2006 Session (Effective July 1, 2006)

Centers of Excellence Legislation Passed in 2006 Session-Effective July 1, 2006

During the 2006 Legislative session, the Legislature passed a bill known as SB 112, sponsored by Senator Thomas V. Hatch and co-sponsored in the House by Representative Peggy Wallace. This bill was designed to enhance the strength and value of the Centers of Excellence program by demonstrating the accountability of the program and its participants to the Legislature and the taxpayers of Utah and by making the Centers of Excellence program more accessible to universities that do not grant doctoral degrees (referred to as "non-doctoral granting institutions).

This legislation has two main sections. The first section modifies the matching funds requirements so that Utah institutions that do not issue doctoral degrees, the "non-doctoral granting schools" would no longer have to meet the 2:1 matching funds requirement. This was intended to enable schools that did not have doctoral programs, and therefore were less frequently involved in ongoing Federal research, to have the opportunity to participate in the Centers of Excellence program.

Instead of the 2:1 matching funds requirement, non-doctoral schools are required, through policy (see section on new Policies) to meet a 1:1 matching funds requirement. This change was greeted with great enthusiasm by the relevant schools and was supported by the doctoral granting institutions as well.

The concept of greater accountability to the Legislature in the COE program was added in the second section of the bill by introducing a concept called the "return of grant". This provision asks the universities to track licensees of those technologies which have been supported by Centers of Excellence program funds as part of the licensing process. If such licensees are either out of state firms or leave the state within five years of the issuance of the License, the statute asks that the affected college or university will share back with the Centers of Excellence program a portion of the proceeds of the license.

This proposal was presented to the Senate Workforce Services and Community and Economic Development Committee, chaired by Senator Carlene Walker, and passed out of committee with 5 Yea votes, 0 Nay Votes, and 2 absences. The bill was subsequently presented to the full Senate, and passed the Senate with 24 Yeas, 0 Nays with 5 Absent. From the Senate, the bill went to the House Workforce Services and Community and Economic Development Committee, where it was unanimously supported by a vote of 7 yea votes, 0 nay votes and no absences. The bill then went to the House of Representatives and passed with 69 yea votes, 0 nay votes and 6 absences.

More details about how this is administered are to be developed by the Governor's Office of Economic Development as part of the program's policies and procedures.

CENTERS OF EXCELLENCE AMENDMENTS

2006 GENERAL SESSION

STATE OF UTAH

Chief Sponsor: Thomas V. Hatch

House Sponsor: Peggy Wallace

LONG TITLE

General Description:

This bill modifies provisions related to the Centers of Excellence Act.

Highlighted Provisions:

This bill:

. recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis for colleges and universities in the state that offer any doctoral degrees;

. requires the Governor's Office of Economic Development to develop a process to determine whether to require the return of economic development Centers of Excellence grant moneys from a higher education institution if the technology that is developed from grant proceeds is licensed to a licensee that does not maintain a manufacturing or service location in the state from which the technology is exploited or transfers the manufacturing or service location out of state within a five-year period after the issuance of the license; and

. makes certain technical changes.

Monies Appropriated in this Bill:

None

Other Special Clauses:

None

Utah Code Sections Affected:

AMENDS:

63-38f-701, as renumbered and amended by Chapter 148, Laws of Utah 2005

63-38f-704, as renumbered and amended by Chapter 148, Laws of Utah 2005

Be it enacted by the Legislature of the state of Utah:

Section 1. Section **63-38f-701** is amended to read:

63-38f-701. Purpose.

(1) (a) The Legislature recognizes that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes.

(b) These generally come from strong research colleges and universities.

(c) Technical research in Utah's colleges and universities should be enhanced and expanded, particularly in those areas targeted by the state for economic development.

(d) Most states are enhancing their research base by direct funding, usually on a matching basis.

(e) The purpose of this part is to catalyze and enhance the growth of these technologies by encouraging interdisciplinary research activities in targeted areas.

(f) The Legislature recognizes that one source of funding is in matching state funds with federal funds and industrial support to provide the needed new technologies.

(2) The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis *for colleges and universities in the state that offer any doctoral degrees*.

(3) (a) The Legislature recommends that the funds be allocated on a competitive basis to the various colleges and universities in the state.

(b) The funds made available should be used to support interdisciplinary research in specialized Centers of Excellence in technologies that are considered to have potential for economic development in this state.

Section 2. Section **63-38f-704** is amended to read:

63-38f-704. Administration -- Grants.

(1) [This part shall be administered by the] *The* Governor's Office of Economic Development *shall administer this part*.

(2) *(a)* The office may award grants to the various colleges and universities in the state for the purposes of this part.

(b) The governor's Office of Economic Development shall develop a process to determine whether a college or university that receives a grant under this part must return the grant proceeds if the technology that is developed with the grant proceeds is licensed to a licensee that:

(i) does not maintain a manufacturing or service location in the state from which the licensee or a sublicensee exploits the technology; or

(ii) initially maintains a manufacturing or service location in the state from which the licensee or a sublicensee exploits the technology, but within five years after issuance of the license the licensee or sublicensee transfers the manufacturing or service location for the technology to a location out of the state.

(3) (a) Funding allocations shall be made by the office with the advice of the State

Advisory Council for Science and Technology and the board.

(b) Each proposal shall receive the best available outside review.

(4) (a) In considering each proposal, the office shall weigh technical merit, the level of matching funds from private and federal sources, and the potential for job creation and economic development.

(b) Proposals or consortia that combine and coordinate related research at two or more colleges and universities shall be encouraged.

(5) The State Advisory Council on Science and Technology shall review the activities and progress of individual centers on a regular basis and assist the office in preparing an annual report on the accomplishments and direction of the Centers of Excellence Program.

Updated Policies Implemented Feb 13, 2006

The following Centers of Excellence Program Guideline Changes and Updates were Implemented
Feb 13, 2006
Director Nicole Toomey Davis

Centers support for licensed technologies

Past: once a technology was licensed to a company, the Center could no longer be funded or support the technology.

Opportunity:
Permit a Center to continue to support a licensed technology for a certain period of time or under certain conditions in order to better support the transition from university to industry.

New Guideline:
When a Center-supported technology is licensed to an existing established firm, the Center can use the COE funding to support that technology through the end of the current fiscal year (i.e. current contract).
When a Center-supported technology is licensed to a startup/spinout, the Center can use the COE funding to support that technology through the end of the current fiscal year (i.e. current contract).
In addition, the Center may apply for renewal of funding from the COE program (subject to the normal term of up to 4 years), to enable the Center and Business Team to continue to support the technology AND those commercial applications UNTIL a) the startup/spinout completes an arms-length financing transaction with a value equal to or greater than $500,000 or b) the startup/spinout is awarded one or more contracts with a value equal to or greater than $500,000.
In all situations, if there are still significant applications of the technology available for licensing (other vertical markets) the Center may apply for renewal of funding from the COE program on a competitive basis.

Ability to Start the COE Funding Clock over for new Opportunities

Past: Once a Center was "done" with one round of funding, they could not really "come back" into the program unless it was a "new Center" (with new PI)

Opportunity:
Proposed: Dynamic Centers teams and PIs have many areas of research that can provide new Market Opportunities

COE should encourage them to continue to bring new technologies to the program for new Market Opportunities

New Guideline:
A former Center of Excellence (one that has "graduated"), may return to the program and request a new series of funding years, typically up to 4 years, as long as the technology that is being proposed for commercialization is different enough from the original Center to create new market, business and licensing opportunities. However, it should NOT be used to extend the life of a Center that failed to achieve their commercialization goals. The Center may either keep its same name with a differentiating designation (example "Center II"), OR may propose under a new name. The PI may be the same PI or may be a different PI (but there is no requirement to make a change).

Additional Item of Clarification from the Feb 13, 2006 Meeting of the SAC

The council concurs with the Director that PI's/Researchers do NOT have to be tenured to be considered as a Director for a Center of Excellence.

Matching Requirements for schools that do not offer Doctoral degrees

During the 2006 legislative session, the Utah State Legislature passed, with no dissenting votes, SB 112, Centers of Excellence Amendments. One of amendments included in this bill narrowed the requirement of the 2:1 match to schools that offer Doctoral degrees (language listed below). This statutory change also required match guidelines for schools that do not offer doctoral degrees. The new guidelines are listed below.

Statutory Change
"The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis for colleges and universities in the state that offer any doctoral degrees"

New Guidelines:
- For a non-doctoral-degree granting school, a stand-alone Center will be required to have its Centers of Excellence funds to be matched by industry and federal grants on at least a 1:1 basis.

When a non-doctoral-degree granting school partners with a school that does grant doctoral degrees, the non-doctoral-degree granting school will not be required to have a match for their portion of the COE funding. The doctoral-granting school will be required to meet their 2:1 match as per statute.
Note: The COE Statute specifies that, "Proposals or consortia that combine and coordinate related research at two or more colleges and universities shall be encouraged."

Center Designation – Funding + 3 years

Past: Conflicting interpretations of use of "Utah Center of Excellence" Title

New Guideline:
A Center can use the "Utah Center of Excellence Designation" (and logo) for the term of funding plus 3 years. After that they can refer to being a "former Utah Center of Excellence". If, after 3 years, a Center is still actively supporting the commercialization of the technology which was funded through the Center, they may apply to the Director for an extension of the use of the title.

Clarification: The name of the Center ("Center for New Technology") is not covered by this guideline and it is up to the college/university, PI and team to determine its appropriate use.

Accountability of Licensing Decisions in Centers of Excellence

During the 2006 legislative session, the Utah State Legislature passed, with no dissenting votes, SB 112, Centers of Excellence Amendments. The Second Statutory Change in SB 112 is detailed below.

"The Governor's Office of Economic Development shall develop a process to determine whether a college or university that receives a grant under this part must return the grant proceeds if the technology that is developed with the grant proceeds is licensed to a licensee that:

(i) does not maintain a manufacturing or service location in the state from which the licensee or a sublicensee exploits the technology; or

(ii) initially maintains a manufacturing or service location in the state from which the licensee or a sublicensee exploits the technology, but within five years after issuance of the license the licensee or sublicensee transfers the manufacturing or service location for the technology to a location out of the state."

The Governor's Office of Economic Development is currently in the process of establishing the process specified in the statute. The State Advisory Council on Science and Technology, as requested by the Office, has convened a task force to make recommendations to GOED on this process. In addition, the Governor's Office of Economic Development Board will provide final review and approval of the process.